Trig Final (SLTN v662)
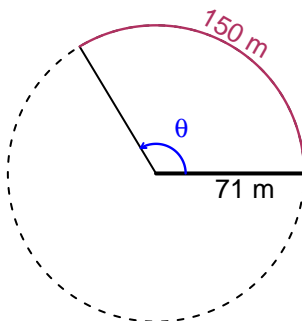
- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 150 meters. The radius is 71 meters. What is the angle measure in radians?
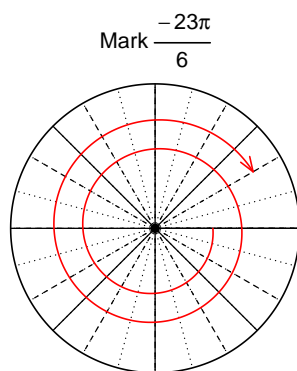

$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$
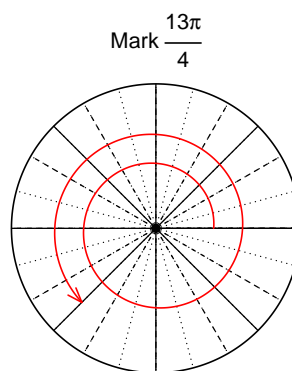
$\theta = 2.113$ radians.

Question 2

Consider angles $\frac{-23\pi}{6}$ and $\frac{13\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-23\pi}{6}\right)$ and $\sin\left(\frac{13\pi}{4}\right)$ by using a unit circle (provided separately).

Mark $\dfrac{-23\pi}{6}$

Find $\cos(-23\pi/6)$

Mark $\dfrac{13\pi}{4}$

Find $\sin(13\pi/4)$

$\cos(-23\pi/6) = \frac{\sqrt{3}}{2}$
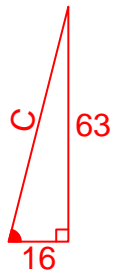
$\sin(13\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\tan(\theta) = \frac{-63}{16}$, and θ is in quadrant IV, determine an exact value for $\sin(\theta)$.
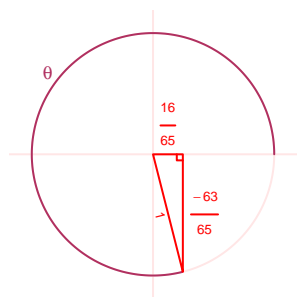
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.

Solve the Pythagorean Equation

$$16^2 + 63^2 = C^2$$
$$C = \sqrt{16^2 + 63^2}$$
$$C = 65$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.

$$\sin(\theta) = \frac{-63}{65}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 3.18 meters, a frequency of 4.78 Hz, and a midline at $y = -5.89$ meters. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -3.18\cos(2\pi 4.78t) - 5.89$$

or

$$y = -3.18\cos(9.56\pi t) - 5.89$$

or

$$y = -3.18\cos(30.03t) - 5.89$$